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CONVERGING MULTIPLE PRINT QUEUES TO SINGLE UNIVERSAL PRINT QUEUE

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Converging Multiple Print Queues to Single Universal Print Queue

Abstract: - Managing and maintaining a multitude of print queues is a costly affair for any IT department in an enterprise environment. This not only costs money but also time and human efforts. The cost is not confined to the enterprise but also to the developer of the printer and related software products. This paper attempts to provide a solution to eliminate or reduce the print queue clutter on customer's personal computers and thus reduce cost, time and stress of managing & maintaining the printing systems and software.

Key-Words: - Print Queue, Printer Driver, Print Queue Clutter, Universal Print Queue, Universal Printer Driver

1 Introduction

Enterprises and Small-Medium-Businesses generally deploy about 10s to a few 1000 printers in their offices. These printers are used by their 100-1000+ employees. Each employee connects to at least a few dozen printers and thus creates a similar number of print queues on their personal computer. Server computers in these premises create 1000s of print queues to cover the variety of printers or differing policies applied to the same printer. These usage scenarios create a print queue clutter on most such personal computers and especially print servers.

This paper is targeted towards print queues on Windows Operating Systems.

The following sections describe the problems associated with print queues. We then present some approaches leaning towards simplifying the problems but not solving it and finally we present our solution to the problem.

2 Problem

Every addition of a print queue adds to the following costs:

1. Cost of deployment of the print queue.
2. Cost of configuring the print queue.
3. Cost of integrating it into the business workflows.
4. Cost of updating/upgrading the driver of the print queue.

Additional problems associated with many print queues:

1. It takes on an average 6 months to 1 year to update/upgrade drivers on the print queues.
2. Migrating print queues to a new driver takes multi-year planning, development and deployment.
3. Replacing print queue with new queue becomes a complex process as it has to take care of configuring print queues, applying various policies at different scope & levels etc.

In short, the IT management cost, maintenance time & effort involved and the complexity of managing these queues increases as the print queue count present on the system increases.

3 Past Approaches

After the studying the printer drivers and print queues that exist today, we identified the following two features to help overcome some of the problems associated with multiple print queues. These features also try to reduce the print queue to some extent but that is a byproduct of using the feature for its primary purpose which is helping a user print a document to one of many printers. These features were not looked upon by the developing company or customers either in the past or in future as a solution to the queue clutter problem.

The first of these features is called "Printer Pooling". It connects multiple print devices to one print queue through multiple printer ports. The goal of printer pooling is to increase the success rate of printing and not to reduce the queue clutter. Also, it can only serve same printer models over the single queue.

Problems with Printer pooling:

- It requires one queue to be connected to 2 or more ports.
- It supports only homogenous printers (similar capabilities) as against Heterogenous Printers (found typically in an Enterprise across various Departments)
- Adding a new device to the fleet requires a good deal of administrative work.
- Driver updates and migration is quite complex.

The second of these features is called “Dynamic Mode Printing”. This feature aims to reduce queue creations and thus tries to solve the clutter, but they are only superficial.

Problems with Dynamic Mode:

- They are not PDL agnostic and thus do not support a fleet of heterogenous devices.
- They are technically fixed and limited to PCL6 and TCPIP and thus these queues are not universal in nature.
- Incorporating differentiating policies and business workflows require more queues to be created instead of reducing it.
- Driver update and migration is quite complex.

4 Solution

We present a solution which targets to eliminate or reduce the print queue clutter to overcome the problems associated with the management of multiple print queues. Keeping the functionality intact is taken care of by other related patented innovations [1]. The problem is solved by creating and deploying a single Universal Print Queue. These universal print queues can be created in two different methods as described below.

Method 1: Active Reduction

In this method the solution SUPPRESSES the creation of new print queues actively by creating the one and only Universal Print Queue. Thus, no clutter is created at the first place. It works when the PrintQueue is being created. It works in scenarios where it has control over the environment.
Figure 1 in appendix B below describes the architecture pertaining to the solution. The following flow explains the solution:

Arrows 1-4 in figure 1 are part of active reduction method.

1. The application creating the queue checks if the One PrintQueue is already created.
2. The application takes care of various scenarios in which queues can be created and eliminates the actual queue creation while still achieving the objective.
3. The queue is configured and maintained by application.

Any request to connect devices over various protocols are superseded by application and device is made available via the single universal queue.

Method 2: Passive Reduction

In this method the solution “DETECTS” the clutter on a machine at specific events and clears the clutter by converging the queues into single Universal Print Queue in the earliest possible time (in most cases as soon as the clutter is being introduced). It works irrespective of the way the “PrintQueue” is being created. It works also in scenarios where it does not have control over the environment.

Figure 1, in appendix B below, describes the architecture pertaining to the solution. The following flow explains the solution:

Arrows 5-8 are part of passive reduction method.

1. User connects a device over TCPIP.
2. Add Printer Wizard installs the device as usual increasing the CLUTTER.
3. PQ Monitoring Service detects addition of a new PrintQueue.
4. PQ Monitoring Services notifies PQ Management Service about the new queue addition.

PQ Management Service then transforms the specific queue into single universal queue and removes the specific queue.

5 Conclusion

This paper presented a problem especially important and more relevant to the customer organizations than the technical community. Then 2 methods to solve this problem were presented which covers all the cases in which this problem can arise. Additionally, the solution also targets improving the user experience at the same importance level as other factors related to the cost. This solution can be further improved to handle pull print scenarios, cloud scenarios etc.

6 Appendix: - A

Term	Definition
Page Description Language (PDL)	A page description language (PDL) is a computer language that describes the appearance of a printed page in a higher level than an actual output bitmap (or generally raster graphics).
Printer Command Language (PCL)	A PDL specification and implementation developed by HP.
Printer Job Language (PJL)	A method developed by HP for switching printer languages at the job level, and for status readback between the printer and the host computer.
Universal Printer Driver (UPD)	The legacy per PDL UPD that can dynamically configure a queue according to the device connected to the queue.
Smart Universal Printer Driver (SUPD)	A UPD with smart functionalities such as generating a PDL dynamically based on the device connected to the queue.
Bi-directional communication (BiDi)	A communication mechanism used primarily to know the printer capabilities and configure the queue accordingly.
Printer Port	A port with physical connection between the print queue and a single printer device. The printer device can be connected locally (USB, LPT, COM) or remotely (WSD, TCPIP, IPP) during installation. 1. Performs BiDi on the device. 2. This is a “Concrete Port”.
Print Queue	An NT-based-operating system user's view of a "printer“ to which one or more physical printer devices can be connected. It binds to a “Printer Port”.

7 Appendix: - B

- *ARCHITECTURE PERTAINING TO THE SOLUTION*

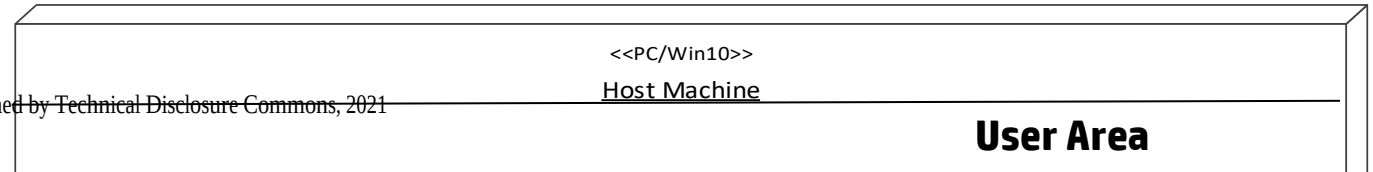
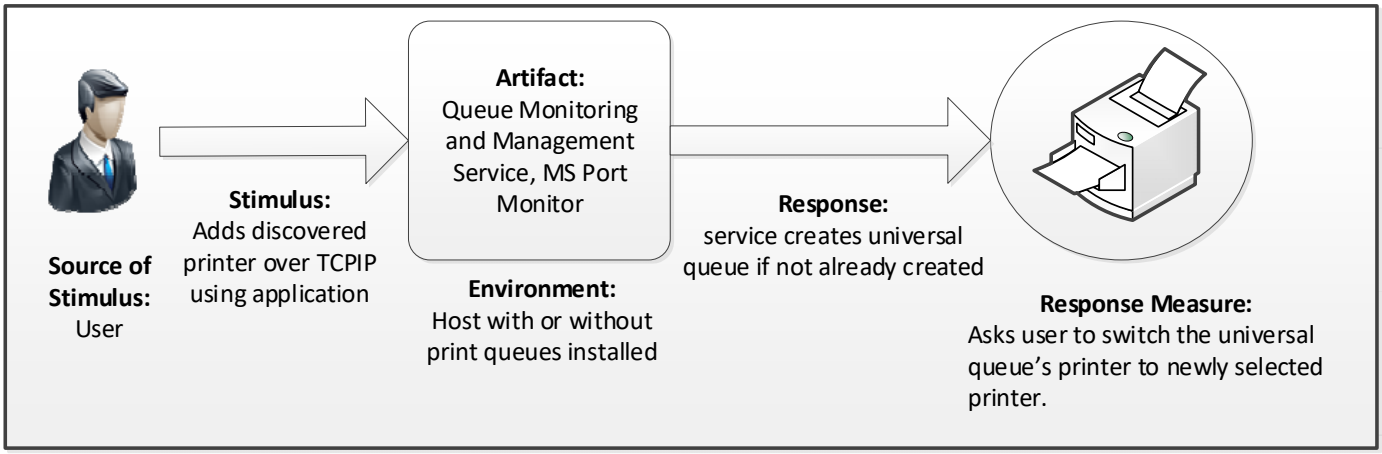
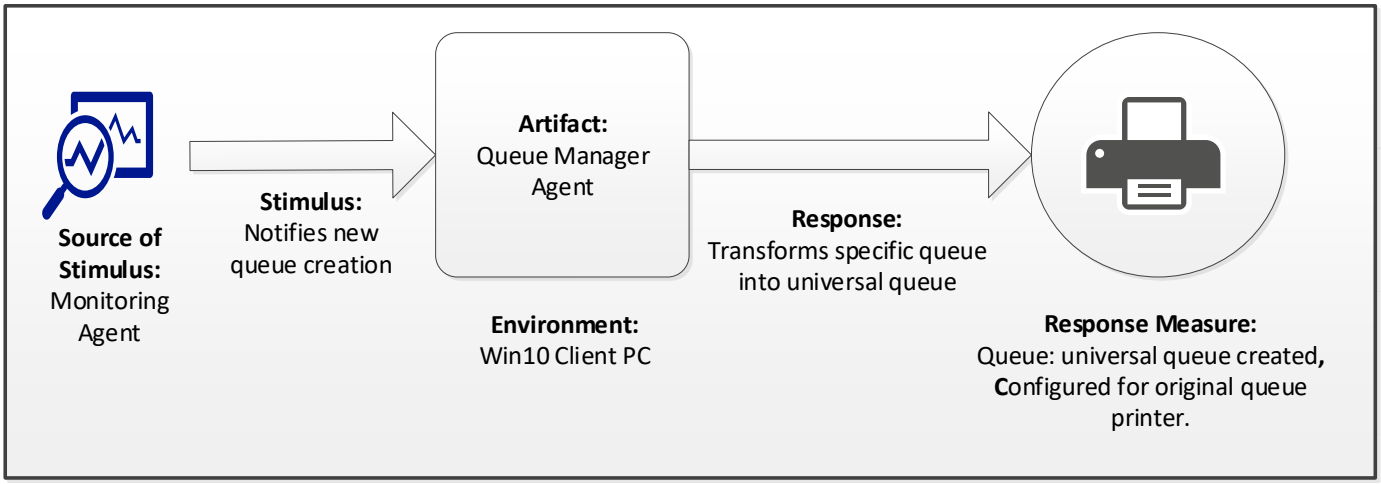


Figure1: Universal PrintQueue Architecture for reducing print queue clutter

- *SAMPLE USE CASES DEPICTION OF SOLUTION*



UseCase1: User adds a discovered N-Queue printer over TCPIP by clicking the "Add Printer" button in application.



UseCase2: User connects the printer over USB.

Disclosed by VIKAS PACHISIA AND SEKHAR MUNI SIRIGIRI, HP INC.